EXHIBIT E

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] This invention relates to the storage which applied to development of the program included in real-time control systems which should be controlled by real time, such as various electronic equipment, such as facsimile and a copying machine, and a SCS of various facilities, such as a power plant, in detail about the storage which memorized program development equipment, the program development method, and the program development program, and memorized suitable program development equipment, the program development method, and the program development program.
[0002]
[Description of the Prior Art] A large number [a real-time control system / action (action) which is the processing which a system performs] when the event (event) which is the stimulus from the system exteriors, such as reception of various signals, or the interior, and the condition (state) are the action which systems, such as reception standby of various signals, have taken are put together intricately and a specific event moreover occurs under the processing corresponding to such combination, i.e., a specific condition. There is the program development method using the state transition table (State Transition Matrix) as one of the technique which develops the program which should be included in such a real-time control system. An event (event) or a condition (state) is expressed in the two-dimensional matrix arranged, respectively as a state transition table to a train or a line, and the transition place which changes after action corresponding to the crossing portion (cel) of an event and a condition and its action is arranged. Even if that basic design is not a experienced person, while a real-time control system can carry out even large-scale-izing and now when it has complicated according to this program development method, laborsaving and shortening of a development cycle are realizable.
[0003] Drawing 22 is the block diagram which was indicated by JP,9-325952,A and in which showing the example of an electric configuration of conventional program development equipment. The hierarchized state transition table is used for the program development equipment of this example. The definition table input section 1 for inputting the abstract-machine definition which defined actuation of the system containing the activity (activity) which is the processing performed continuously [while staying at the processing time which is staying at each condition, and the condition concerned], The storage section 2 which memorizes the inputted abstract-machine definition as an abstract-machine definition table, The condition hierarchy extract section 3 which extracts the layered structure of a condition from the abstract-machine definition table called from the storage section 2, The processing anticipation time amount calculation section 4 which judges whether the processing anticipation time amount in the condition that calculate the processing anticipation time amount given to the low order condition about each condition in an abstract-machine definition table, and the result is carrying out current attention is exceeded, When the sum total of the processing time of a low order condition exceeds the processing time of a high order condition from the computed result, the outline configuration is carried out from the alarm display section 5 which warns of that. According to such a

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configuration, before operating an actual system, actuation of a system becomes possible [checking whether it performs duly] from the combination of fragmentary processing-time information.

[0004]

[Problem(s) to be Solved by the Invention] By the way, in the above-mentioned conventional program development equipment, the processing anticipation time amount calculation section 4 calculates the processing anticipation time amount given to the low order condition about each condition in an abstract-machine definition table, and when the processing time of the high order condition in which the sum total of the processing time of a low order condition is carrying out current attention is exceeded, the alarm display section 5 is warning of that. However, this processing time is the ideal time amount based on the specification of a real-time control system to the last, and the various events generated actually are not taken into consideration in many cases.

[0005] Therefore, when a program was developed based on such an abstract-machine definition table, it included in a system and the fault of a system not operating as specification occurred, there was a defect that it had to retrace its steps and correct to the phase of a basic design. Thereby, a development cycle will delay. Moreover, since it could not usually retrace its steps and correct to the phase of a basic design when the above faults occurred in the culmination of a development cycle in such a case although the development cycle of a system was restricted, if it was with stopgap correction, a colander was not obtained, but there was a defect that the quality of a system will worsen.

[0006] This invention was made in view of the above-mentioned situation, and aims at offering the storage which memorized the program development equipment, the program development method, and program development program which can realize shortening of the development cycle of the program included in a real-time control system, and upgrading of a system.

[0007]

[Means for Solving the Problem] In order to solve the above-mentioned technical problem, program development equipment concerning invention according to claim 1 It has two or more cels specified with the condition of a system which is the object of program development that it can take, and an event which is the stimulus from the exterior or the interior of the above-mentioned system. The state-transition-table storage section a state transition table which described the contents of processing which the above-mentioned system should perform when an event which corresponds under a condition corresponding to each cel occurs, and a condition of a transition place which should change is remembered to be, The time amount information storage section a hour entry corresponding to each cel of the above-mentioned state transition table is remembered to be, By accumulating a hour entry corresponding to an event by which a sequential input is carried out, and a cel by which sequential specification is carried out in the state of a transition place described by a condition or each cel inputted as an initial state It is characterized by coming to have a simulator which finds the processing time at the time of carrying out the simulation of the actuation of the above-mentioned system.

[0008] Invention according to claim 2 relates to program development equipment according to claim 1, and it detects that either of each display position of two or more events which constitute the above-mentioned state transition table displayed on a display, or two or more conditions was directed. It has the input section which inputs positional information about the display position into the above-mentioned simulator. The above-mentioned simulator The analysis section which changes into an event code or a condition code corresponding to the display position concerned positional information inputted by the above-mentioned input section, The condition storing section in which a condition of a transition place described by a condition or each cel corresponding to the above-mentioned condition code is stored, The time amount accumulation section by which the above-mentioned hour entry is accumulated, and the condition corresponding to the above-mentioned condition code are stored in the above-mentioned condition storing section as the above-mentioned initial state. It is based on the condition of being stored in an event and the above-mentioned condition storing section corresponding to the above-mentioned event code. A cel which corresponds from the above-mentioned state-transition-table storage section with reference to a state transition table by which reading appearance was carried out is determined. It is carrying out consisting of the state-transition judging section which reads a hour entry

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corresponding to a determined cel from the above-mentioned time amount information storage section, reads a condition of a transition place which accumulated in the above-mentioned time amount accumulation section, and was described by cel which made [above-mentioned] a decision from the above-mentioned state-transition-table storage section, and is stored in the above-mentioned condition storing section as the feature.

[0009] Invention according to claim 3 relates to program development equipment according to claim 1. The above-mentioned initial state, It has the event input section which inputs into the above-mentioned simulator a trial script file which described generating timing of each event described by the above-mentioned state transition table, and timing to which the above-mentioned structure-of-a-system element should operate on specification. The event analysis section which creates an event input sequence rearranged into time order which generates two or more events of a trial script file in which the above-mentioned simulator was inputted by the above-mentioned event input section, The condition storing section in which a condition of a transition place described by the above-mentioned initial state or each cel is stored, The above-mentioned initial state is stored in the condition storing section with the time amount accumulation section by which the above-mentioned hour entry is accumulated. It is based on the condition of being stored in an event and the above-mentioned condition storing section which are incorporated by early order of time amount from the above-mentioned event input sequence. A cel which corresponds from the above-mentioned state-transition-table storage section with reference to a state transition table by which reading appearance was carried out is determined. It is carrying out consisting of the state-transition judging section which reads a hour entry corresponding to a determined cel from the above-mentioned time amount information storage section, reads a condition of a transition place which accumulated in the above-mentioned time amount accumulation section, and was described by cel which made [above-mentioned] a decision from the above-mentioned state-transition-table storage section, and is stored in the above-mentioned condition storing section as the feature.

[0010] Invention according to claim 4 relates to program development equipment according to claim 3, and is characterized by having the trial script file creation section which creates the above-mentioned trial script file from hysteresis of activation of a simulation performed in the above-mentioned simulator by the above-mentioned initial state and two or more above-mentioned event lists which were inputted by actuation of a control unit based on these.

[0011] Invention according to claim 5 relates to claim 1 thru/or program development equipment given in any 1 of 4. The above-mentioned simulator Subtract accumulation time amount by which current storage is carried out in the above-mentioned time amount accumulation section from generating time of day of the above-mentioned event, and when a subtraction result is positive The above-mentioned subtraction result difference which is the difference of the processing time about a processing instruction to a peripheral device of a control section which constitutes the above-mentioned system, and the processing time of a peripheral device which processes based on the above-mentioned processing instruction -- it is characterized by having a time amount comparator added to accumulation time amount by which current storage is carried out at the above-mentioned time amount accumulation section as time amount.

[0012] Invention according to claim 6 relates to claim 1 thru/or program development equipment given in any 1 of 5. In the above-mentioned state-transition-table storage section A state transition table about actuation of a control section which constitutes the above-mentioned system, and a state transition table about actuation of a peripheral device controlled by the above-mentioned control section are memorized. In the above-mentioned time amount information storage section A hour entry about actuation of the above-mentioned control section and a hour entry about actuation of the above-mentioned peripheral device are memorized. The above-mentioned simulator The 1st simulator which accumulates a hour entry about actuation of the above-mentioned control section, and the 1st simulator of the above are characterized by consisting of the 2nd simulator which accumulates a hour entry about actuation of the above-mentioned peripheral device independently.

[0013] Invention according to claim 7 relates to claim 1 thru/or program development equipment given in any 1 of 6. A radionuclide generator which creates a source program which should be included in the

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above-mentioned system based on the above-mentioned state transition table, and which was described with programming language, A compiler which changes the above-mentioned source program into an object program described in absolute language, A working speed of a control section which constitutes the above-mentioned system, It is characterized by having the 1st calculation section which computes a hour entry corresponding to each cel by carrying out the multiplication of the number of codes of absolute language which constitutes the above-mentioned object program corresponding to processing described by each cel of the above-mentioned state transition table, or transition before and behind that.

[0014] Invention according to claim 8 relates to claim 1 thru/or program development equipment given in any 1 of 7. A radionuclide generator which creates a source program which should be included in the above-mentioned system based on the above-mentioned state transition table, and which was described with programming language, A compiler which changes the above-mentioned source program into an object program described in absolute language, The above-mentioned object program is performed. An incircuit emulator which can perform processing almost equivalent to actual actuation of the above-mentioned system, or a code simulator, It is characterized by having the 2nd calculation section which computes a hour entry corresponding to each cel of the above-mentioned state transition table based on the execution time obtained by activation of the above-mentioned object program by the above-mentioned incircuit emulator or code simulator.

[0015] Invention according to claim 9 relates to program development equipment according to claim 8. The above-mentioned time amount information storage section The 1st time amount information storage section a hour entry inputted by actuation of a control unit corresponding to each cel of the above-mentioned state transition table is remembered to be, The 2nd time amount information storage section a hour entry computed by the calculation section of the above 1st corresponding to each cel of the above-mentioned state transition table is remembered to be, Inside of the 3rd time amount information storage section a hour entry computed by the calculation section of the above 2nd corresponding to each cel of the above-mentioned state transition table is remembered to be, It consists of at least two and the above-mentioned simulator is characterized by having a comparator which compares an accumulation result of having accumulated a hour entry corresponding to the time of a simulation based on a hour entry memorized by at least two, the above 1st thru/or the 3rd time amount information storage section.

[0016] Invention according to claim 10 relates to claim 1 thru/or program development equipment given in any 1 of 9. In the above-mentioned time amount information storage section or the time amount information storage section of the above 1st Corresponding to each cel of the above-mentioned state transition table, a hour entry is memorized as a value with width of face according to tolerance on specification of the above-mentioned system, or a variable. The above-mentioned simulator In case a hour entry corresponding to a cel specified from the above-mentioned time amount information storage section or the time amount information storage section of the above 1st is read Maximum, the minimum value, the average, or a value chosen at random is read among values with the above-mentioned width of face, or it is characterized by changing a hour entry which should be accumulated according to the above-mentioned variable.

[0017] Invention according to claim 11 relates to claim 3 thru/or program development equipment given in any 1 of 10, and the above-mentioned trial script file is characterized by being timing chart format, text format, or message inspection sequence chart format.

[0018] Invention according to claim 12 relates to claim 1 thru/or program development equipment given in any 1 of 11, and the above-mentioned hour entry is characterized by being the processing time taken to perform processing described by corresponding cel.

[0019] Invention according to claim 13 relates to program development equipment according to claim 12, and is characterized by consisting of an overhead time which transition to the above-mentioned processing time, a certain condition or a condition of others [processing / a certain], or other processings takes to the above-mentioned hour entry.

[0020] Invention according to claim 14 relates to program development equipment according to claim 13, and is characterized by for the above-mentioned overhead times differing for every uniform cel, or differing for every transition.

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[0021] A program development method concerning invention according to claim 15 It has two or more cels specified with the condition of a system which is the object of program development that it can take, and an event which is the stimulus from the exterior or the interior of the above-mentioned system. The state-transition-table storage section a state transition table which described the contents of processing which the above-mentioned system should perform when an event which corresponds under a condition corresponding to each cel occurs, and a condition of a transition place which should change is remembered to be, An event by which is equipped with the time amount information storage section a hour entry corresponding to each cel of the above-mentioned state transition table is remembered to be, and a sequential input is carried out, By accumulating a hour entry corresponding to a cel by which sequential specification is carried out in the state of a transition place described by a condition or each cel inputted as an initial state, it is characterized by finding the processing time at the time of carrying out the simulation of the actuation of the above-mentioned system.

[0022] Invention according to claim 16 relates to a program development method according to claim 15, and it detects that either of each display position of two or more events which constitute the above-mentioned state transition table displayed on a display, or two or more conditions was directed. A step which changes into an event code or a condition code corresponding to the display position concerned positional information which was equipped with the input section which inputs positional information about the display position, and was inputted by the above-mentioned input section, A step which stores the condition corresponding to the above-mentioned condition code in the condition storing section as the above-mentioned initial state, A step which determines a cel which corresponds with reference to a state transition table by which reading appearance was carried out from the above-mentioned state-transition-table storage section based on the condition of being stored in an event and the above-mentioned condition storing section corresponding to the above-mentioned event code, A step which reads a hour entry corresponding to a cel by which a decision was made [above-mentioned] from the above-mentioned time amount information storage section, and is accumulated in the time amount accumulation section, It is characterized by consisting of a step which reads a condition of a transition place described by cel by which a decision was made [above-mentioned] from the above-mentioned state-transition-table storage section, and is stored in the above-mentioned condition storing section.

[0023] Invention according to claim 17 relates to a program development method according to claim 15. The above-mentioned initial state, It has the event input section which inputs a trial script file which described generating timing of each event described by the above-mentioned state transition table, and timing to which the above-mentioned structure-of-a-system element should operate on specification. A step which creates an event input sequence rearranged into time order which generates two or more events of a trial script file inputted by the above-mentioned event input section, It is based on the condition of being stored in a step which stores the above-mentioned initial state in the condition storing section, an event incorporated by early order of time amount from the above-mentioned event input sequence, and the above-mentioned condition storing section. A step which determines a cel which corresponds from the above-mentioned state-transition-table storage section with reference to a state transition table by which reading appearance was carried out, A step which reads a hour entry corresponding to a cel by which a decision was made [above-mentioned] from the above-mentioned time amount information storage section, and is accumulated in the time amount accumulation section, It is characterized by consisting of a step which reads a condition of a transition place described by cel by which a decision was made [above-mentioned] from the above-mentioned state-transition-table storage section, and is stored in the above-mentioned condition storing section.

[0024] Invention according to claim 18 relates to a program development method according to claim 17, and is characterized by having a step which creates the above-mentioned trial script file from hysteresis of activation at the time of carrying out the simulation of the actuation of the above-mentioned system to the above-mentioned initial state and two or more above-mentioned event lists which were inputted by actuation of a control unit based on these.

[0025] Invention according to claim 19 relates to claim 15 thru/or a program development method given in any 1 of 18. Subtract accumulation time amount by which current storage is carried out in the above-

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mentioned time amount accumulation section from generating time of day of the above-mentioned event, and when a subtraction result is positive The above-mentioned subtraction result difference which is the difference of the processing time about a processing instruction to a peripheral device of a control section which constitutes the above-mentioned system, and the processing time of a peripheral device which processes based on the above-mentioned processing instruction -- it is characterized by having a step added to accumulation time amount by which current storage is carried out at the above-mentioned time amount accumulation section as time amount.

[0026] Invention according to claim 20 relates to claim 15 thru/or a program development method given in any 1 of 19. In the above-mentioned state-transition-table storage section A state transition table about actuation of a control section which constitutes the above-mentioned system, and a state transition table about actuation of a peripheral device controlled by the above-mentioned control section are memorized. In the above-mentioned time amount information storage section A step which a hour entry about actuation of the above-mentioned control section and a hour entry about actuation of the above-mentioned peripheral device are memorized, and accumulates a hour entry about actuation of the above-mentioned control section, It is characterized by having a step which accumulates a hour entry about actuation of the above-mentioned peripheral device independently of the above-mentioned step.

[0027] Invention according to claim 21 relates to claim 15 thru/or a program development method given in any 1 of 20. A step which creates a source program which should be included in the above-mentioned system based on the above-mentioned state transition table, and which was described with programming language, A step which changes the above-mentioned source program into an object program described in absolute language, A working speed of a control section which constitutes the above-mentioned system, It is characterized by having a step which computes a hour entry corresponding to each cel by carrying out the multiplication of the number of codes of absolute language which constitutes the above-mentioned object program corresponding to processing described by each cel of the above-mentioned state transition table, or transition before and behind that.

[0028] Invention according to claim 22 relates to claim 15 thru/or a program development method given in any 1 of 21. A step which creates a source program which should be included in the above-mentioned system based on the above-mentioned state transition table, and which was described with programming language, A step which changes the above-mentioned source program into an object program described in absolute language, It is characterized by having a step which performs the above-mentioned object program, and a step which computes a hour entry corresponding to each cel of the above-mentioned state transition table based on the execution time obtained by activation of the above-mentioned object program.

[0029] Invention according to claim 23 relates to a program development method according to claim 22. The above-mentioned time amount information storage section The 1st time amount information storage section a hour entry inputted by actuation of a control unit corresponding to each cel of the above-mentioned state transition table is remembered to be, The 2nd time amount information storage section a hour entry computed by step which computes a hour entry according to claim 21 corresponding to each cel of the above-mentioned state transition table is remembered to be, Inside of the 3rd time amount information storage section a hour entry computed by step which computes a hour entry according to claim 22 corresponding to each cel of the above-mentioned state transition table is remembered to be, It consists of at least two and is characterized by having a step which compares an accumulation result of having accumulated a hour entry corresponding to the time of a simulation based on a hour entry memorized by at least two, the above 1st thru/or the 3rd time amount information storage section.

[0030] Invention according to claim 24 relates to claim 15 thru/or a program development method given in any 1 of 23. In the above-mentioned time amount information storage section or the time amount information storage section of the above 1st Corresponding to each cel of the above-mentioned state transition table, a hour entry is memorized as a value with width of face according to tolerance on specification of the above-mentioned system, or a variable. In case a hour entry corresponding to a cel specified from the above-mentioned time amount information storage section or the time amount information storage section of the above 1st is read Maximum, the minimum value, the average, or a

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value chosen at random is read among values with the above-mentioned width of face, or it is characterized by having a step which changes a hour entry which should be accumulated according to the above-mentioned variable.
[0031] Invention according to claim 25 relates to claim 17 thru/or a program development method given in any 1 of 24, and the above-mentioned trial script file is characterized by being timing chart format, text format, or message inspection sequence chart format.
[0032] Invention according to claim 26 relates to claim 15 thru/or a program development method given in any 1 of 25, and the above-mentioned hour entry is characterized by being the processing time taken to perform processing described by corresponding cel.
[0033] Invention according to claim 27 relates to a program development method according to claim 26, and is characterized by consisting of an overhead time which transition to the above-mentioned processing time, a certain condition or a condition of others [processing / a certain], or other processings takes to the above-mentioned hour entry.
[0034] Invention according to claim 28 relates to a program development method according to claim 27, and is characterized by for the above-mentioned overhead times differing for every uniform cel, or differing for every transition.
[0035] A storage concerning invention according to claim 29 is characterized by memorizing a program development program for making claim 1 thru/or any 1 of 28 realize a function of a publication to a computer.
[0036]
[Function] According to the configuration of this invention, shortening of the development cycle of the program included in a real-time control system and upgrading of a system are realizable.
[0037]
[Embodiment of the Invention] Hereafter, the gestalt of implementation of this invention is explained with reference to a drawing. Explanation is concretely given using an example.
A. The 1st example drawing 1 is the block diagram showing the electric configuration of the program development equipment which is the 1st example of this invention. As shown in this drawing, the outline configuration of the program development equipment of this example is carried out from a man machine interface 11, an editor 12, the state-transition-table storage section 13, the processing-time storage section 14, a radionuclide generator 15, the program store section 16, the input section 17, and a simulator 18.
[0038] A man machine interface 11 consisting of display 11a, mouse 11b, keyboard 11c, etc., and an operator referring to the display of display 11a data (a condition --) required in order to operate mouse 11b and keyboard 11c and to create a state transition table In order to input an event, action, a transition place, the processing time, etc. or to perform the simulation for every event based on the state transition table of the real-time control system designed by the simulator 18 by the state transition table By moving cursor to the display area of the event of the state transition table displayed on display 11a by the cursor key of mouse 11b or keyboard 11c, and carrying out the depression of a click or a return key While being used in order to direct the input of the event concerned, the simulation results (the condition of a transition place, accumulation time amount, etc.) supplied from a simulator 18 are displayed on display 11a. Here, the processing time means the time amount which action described by each cel takes.
[0039] An editor 12 memorizes the data and the processing time about a state transition table in the state-transition-table storage section 13 and the processing-time storage section 14 which correspond, respectively while it is based on the condition of having been inputted using the man machine interface 11, an event, action, a transition place, the processing time, etc. and creates and edits a state transition table. The state-transition-table storage section 13 and the processing-time storage section 14 consist of a storage which all has large-scale storage capacity, such as semiconductor memory, such as RAM, FD (floppy disk), and HD (hard disk), and the data and the processing time about a state transition table are memorized, respectively. A radionuclide generator 15 generates automatically the program (source program) which should be included in the real-time control system described with programming language, such as C (brand name), based on the data about the state transition table by which reading

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appearance was carried out from the state-transition-table storage section 13, and memorizes it in the program store section 16. The program-store section 16 consists of a storage which has large-scale storage capacity, such as semiconductor memory, such as RAM, FD, and HD, and a source program is memorized.

[0040] By an operator move cursor to display area displayed on display 11a , such as one event of the state transition tables , and a condition , by the cursor key of mouse 11b or keyboard 11c , and carry out the click of the left carbon button of a mouse , and the depression of a return key , the input section 17 detect the location of cursor when the depression of a click or a return key be carry out , and supply the positional information to analysis section 18a which constitute a simulator 18 . That is, the input section 17 in this example functions as location detecting elements, such as an event and a condition. The outline configuration of the simulator 18 is carried out from analysis section 18a, state-transition judging section 18b, time amount accumulation section 18c, and 18d of condition storing sections. Analysis section 18a changes into an event code, a condition code, etc. corresponding to the location the positional information supplied from the input section 17, and supplies it to state-transition judging section 18b. That is, analysis section 18a in this example functions as transducers, such as a location-event / condition. While state-transition judging section 18b controls each component of the simulator 18 interior The condition corresponding to the condition code supplied from analysis section 18a is set as 18d of condition storing sections as an initialization condition. Furthermore, based on the condition of being stored in the event and 18d of condition storing sections corresponding to the event code supplied from analysis section 18a, a corresponding cel is determined with reference to the state transition table by which reading appearance was carried out from the state-transition-table storage section 13. Moreover, state-transition judging section 18b reads the processing time corresponding to action processed in the determined cel from the processing-time storage section 14, and accumulates it to time amount accumulation section 18c. Furthermore, state-transition judging section 18b supplies the accumulation time amount accumulated by time amount accumulation section 18c and the condition of the transition place stored in 18d of condition storing sections to a man machine interface 11, whenever one simulation is completed, while reading the condition of the transition place described by the cel which self determined from the state-transition-table storage section 13 and storing in 18d of condition storing sections. Time amount accumulation section 18c and 18d of condition storing sections all consist of semiconductor memory, such as RAM, and the condition of accumulation time amount and a transition place is memorized, respectively.

[0041] Next, actuation of the program development equipment of the above-mentioned configuration is explained. First, the program which should be developed with this program development equipment presupposes that it is the program included in the prepaid card sale machine shown in drawing 2 . Here, a prepaid card means the card made from plastics of the abbreviated-name prickle size which is beforehand purchased in the predetermined amount of money, and can purchase goods, a ticket, etc. instead of cash. The outline configuration of this prepaid card sale machine is carried out from the control section 21 which controls the device section 22, and actuation and a display 23, the device section 22 which issues a prepaid card, and the actuation and the display 23 which are operated a prepaid card purchaser referring to the display of a display in order to purchase a prepaid card. ROM25 by which, as for the control section 21, the above-mentioned program was remembered to be CPU (central processing unit)24, Input port 27 for CPU24 to supply a detecting signal, an interrupt signal, etc. which are supplied from each component with which RAM26 to be used, and the device section 22, and actuation and a display 23 for program-execution are constituted to CPU24, The outline configuration is carried out from the output port 28 for supplying a control signal to the motor 35 and 37 grades from which CPU24 constitutes the device section 22.

[0042] The outline configuration shall be carried out from a stacker 29, the card fetch device 30, the card conveyance device 31, sensors 32 and 33, and magnetic-head 34a for magnetic data writing and magnetic-head 34b for magnetic data reading, and, roughly, the device section 22 shall perform actuation shown below. First, while a purchaser injects cash from the cash input port which actuation and a display 23 do not illustrate If the depression of the card class assignment carbon button and card

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issue-of-banknotes directions carbon button which are not illustrated is carried out The motor 35 which constitutes the card fetch device 30 with a roller and a belt drives. One raw card 36 is picked out from the stacker 29 with which two or more prepaid cards (this is called raw card) 36 with which any magnetic data is not written in a band-like magnetic stripe were stored, and it is conveyed by the drawing 2 Nakamigi down. Next, if the raw card 36 is detected by the sensor 32 which consists of a photo coupler etc., while a motor 35 will be suspended, the motor 37 which constitutes the card conveyance device 31 with a roller and a belt drives, the raw card 36 is conveyed in the direction of drawing 2 Nakamigi in a conveyance on the street, and the magnetic data which becomes the magnetic stripe of the raw card 36 from the purchase amount of money, an issue-of-banknotes day, etc. by magnetic-head 34a installed in the conveyance section on the street is written in. And in order that the magnetic data written in now may check whether it is the right A prepaid card to the extent that magnetic data was written in is conveyed in the direction of drawing 2 Nakamigi in a conveyance on the street. When magnetic-head 34b installed in the conveyance section on the street reads magnetic data from a prepaid card and it is judged to be the right A motor 37 is suspended while being discharged from issue-of-banknotes opening which is not illustrated, after the prepaid card concerned is detected by the sensor 33 which is further conveyed in the direction of drawing 2 Nakamigi in a conveyance on the street, and consists of a photo coupler etc. CPU24 controls actuation of the device section 22 explained above through input port 27 and an output port 28 based on the program memorized by ROM25. As specification of the prepaid card sale machine which performs such actuation, it takes 15ms to issue the prepaid card of one sheet, and suppose that the processing time in the card fetch device 30 is 5ms, and the processing time in the card conveyance device 31 is 10ms. Moreover, a prepaid card shall issue banknotes one sheet at a time at a time.

[0043] Referring to the display of display 11a which constitutes a man machine interface 11, he operates mouse 11b and keyboard 11c, and an operator inputs data (a condition, an event, action, a transition place, processing time, etc.) required in order to create the state transition table shown in drawing 3 based on actuation and specification of the above-mentioned prepaid card sale machine. While an editor 12 displays on display 11a which creates the state transition table shown in drawing 3 , and constitutes a man machine interface 11 by this, the data and the processing time about a state transition table are memorized to each predetermined storage area of the state-transition-table storage section 13 and the processing-time storage section 14. In drawing 3 , Motor A and Motor B express the motors 35 and 37 shown in drawing 2 , respectively, and signs S1 and S2 express the sensors 32 and 33 shown in drawing 2 . In the line of the maximum upper case of drawing 3 , the motor 35 has suspended "Motor A." The condition which the condition or motor 35 of the waiting for directions of the prepaid card issue of banknotes is driving The condition which it means (it is hereafter called <a condition 1>), and a motor 37 is driving "during motor B:writing", and is writing magnetic data in the raw card 36 by magnetic-head 34a The condition of having meant (it being hereafter called <a condition 2>), and the motor 37 having driven "during motor B:reading", and having read the magnetic data of a prepaid card by magnetic-head 34b The condition (henceforth <a condition 4>) of standing by a detecting signal being supplied from a sensor 33 is expressed by meaning (it is hereafter called <a condition 3>), and a motor's 37 driving "the waiting for motor B:S2", and discharging a prepaid card from issue-of-banknotes opening. In addition, it is shown that "Motor B" is in the condition of the high order of < condition 2>-<a condition 4>.

[0044] Moreover, the thing for which "the card issue-of-banknotes demand" had the demand of the issue of banknotes of a prepaid card by the depression of a cash injection of the purchaser of a prepaid card, or a predetermined carbon button in the leftmost train of drawing 3 It meant (it is hereafter called <an event 1>), and when, as for "S1:OFF->ON", the raw card 36 passed a sensor 32, the detecting signal of a sensor 32 changed from OFF to ON. Mean (it is hereafter called <an event 2>) and it means that the notice which shows that the writing of the magnetic data which consists of the purchase amount of money, an issue-of-banknotes day, etc. to a magnetic stripe of the raw card 36 by magnetic-head 34a ended "write-in :O.K." normally was supplied (henceforth <an event 3>). "writing : The notice which shows that the writing of the magnetic data to the raw card 36 ended NG" unusually by magnetic-head

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34a was supplied. The notice which shows that it meant (it is hereafter called <an event 4>), and reading of the magnetic data from a prepaid card ended "reading:O.K." normally by magnetic-head 34b was supplied. The notice which shows that it meant (it is hereafter called <an event 5>), and reading of the magnetic data from a prepaid card ended "reading:NG" unusually by magnetic-head 34b was supplied. It means (it is hereafter called <an event 6>), and when a prepaid card passes a sensor 33 and reaches issue-of-banknotes opening, as for "S2:OFF->ON", the detecting signal of a sensor 33 means having changed from OFF to ON (henceforth <an event 7>). Among these, <an event 1> is called a message type event, means receiving the start up message from other tasks, equipment, etc., and <an event 2> and <an event 7> are called a flag type event, and it means reading change of a variable or I/O. Moreover, < event 3>- <an event 6> is called an interruption mold event, and means receiving interruption from the outside.

[0045] Next, in the state transition table shown in drawing 3 , supposing it expresses the portion which an event and a condition intersect (cel), for example, the cel which <a condition 1> and <an event 2> intersect, as a cel (1 2), the contents of description of each cel express the semantics shown below. In a cel (1 1) first, "motor A:ON" In the <condition 1> of calling it the directions waiting of the prepaid card issue of banknotes, generating of the <event 1> of a cash injection of the purchaser of a prepaid card or the issue-of-banknotes demand of a prepaid card based on the depression of a predetermined carbon button is embraced. In order to pick out the raw card 36 from a stacker 29, action which drives a motor 35 is expressed and "" (0.5) expresses that the processing time of the above-mentioned action is 0.5ms. In addition, that the transition place is not described means stopping at the current condition 1, i.e., a <condition>. In a cel (1 2) "motor A:OFF, motor B:ON, and writing" In the <condition 1> that a motor 35 calls it under a drive, the raw card 36 embraces generating of the <event 2> in which the detecting signal of a sensor 32 changed from OFF to ON by passing a sensor 32. While switching conveyance of the raw card 36 to conveyance by the card conveyance device 31 from conveyance by the card fetch device 30 While stopping the drive of a motor 35 and making a motor 37 drive in order to write magnetic data in the raw card 36, action which requires the writing of magnetic predetermined data is expressed to magnetic-head 34a. Moreover, in the cel (1 2), "during => writing", it expresses that a transition place is in <a condition 2>, and "(4)" expresses that the processing time of the sum total of action of a up Norikazu ream is 4ms. In the cel (1 3), "/" performs no action but it means not performing a state transition, either. Since the semantics of "/" is the same also in other cels, the explanation is omitted below.

[0046] In the cel (2 1), an "error message" be in the <condition 2> of write magnetic data in the raw card 36 by magnetic head 34a, and since only the prepaid card of one sheet can issue banknotes at a time on specification when the <event 1> of the issue of banknotes demand of a prepaid card occur further, it express action which display a message to that effect with the indicator of the actuation and the display 23 which constitute a prepaid card sale machine. Moreover, in the cel (2 1), "=> -" means stopping at the current condition 2, i.e., a <condition>, and expresses that the processing time of the above-mentioned action of "(1)" is 1ms. It is in the <condition 2> that "reading" is writing magnetic data in the raw card 36 by magnetic-head 34a in a cel (2 3). In order that the magnetic data now written in the prepaid card may check whether it is the right according to generating of the <event 3> in which the notice which shows that the writing of magnetic data was completed normally was supplied from magnetic-head 34a Action which requires reading of the magnetic data of a prepaid card to the extent that magnetic data was written in of magnetic-head 34b is expressed. Moreover, in the cel (2 3), "during => reading", it expresses that a transition place is in <a condition 3>, and "(1)" expresses that the processing time of the above-mentioned action is 1ms. It is in the <condition 2> that "writing" is writing magnetic data in the raw card 36 by magnetic-head 34a in a cel (2 4). Generating of the <event 4> in which the notice which shows that the writing of magnetic data was completed unusually was supplied from magnetic-head 34a is embraced. Action which requires the writing of the same MAG data for the second time to the prepaid card which failed in the writing of magnetic data from magnetic-head 34a is expressed. Moreover, in the cel (2 4), "=> -" means stopping at the current condition 2, i.e., a <condition>, and expresses that the processing time of the above-mentioned action of "(3)" is 3ms.

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[0047] In a cel (2 5) "an error reset and writing" The <condition 2> of writing magnetic data in the raw card 36 by magnetic-head 34a, Namely, in spite of being in the condition of demanding the writing of magnetic data of magnetic-head 34a When the <event 5> in which the notice which shows that reading of the magnetic data from a prepaid card was completed normally was supplied from magnetic-head 34b occurs, Action which shall judge that abnormalities have occurred in the magnetic heads 34a and 34b, and requires the writing of initialization and the same MAG data for the second time to a prepaid card from the magnetic heads 34a and 34b is expressed. Moreover, in the cel (2 5), "=> -" means stopping at the current condition 2, i.e., a <condition>, and expresses that the processing time of the above-mentioned action of "(4)" is 4ms. In a cel (2 6) "an error reset and writing" The <condition 2> of writing magnetic data in the raw card 36 by magnetic-head 34a, Namely, in spite of being in the condition of demanding the writing of magnetic data of magnetic-head 34a When the <event 5> in which the notice which shows that reading of the magnetic data from a prepaid card was completed unusually was supplied from magnetic-head 34b occurs, Action which shall judge that abnormalities have occurred in the magnetic heads 34a and 34b, and requires the writing of initialization and the same MAG data for the second time to a prepaid card from the magnetic heads 34a and 34b is expressed. Moreover, in the cel (2 6), "=> -" means stopping at the current condition 2, i.e., a <condition>, and expresses that the processing time of the above-mentioned action of "(4)" is 4ms.

[0048] In the cel (3 1), an "error message" is in the <condition 3> of having read the magnetic data of a prepaid card, and since only the prepaid card of one sheet can issue banknotes at a time on specification when the <event 1> of the issue of banknotes demand of a prepaid card occurs further, it expresses action which displays a message to that effect with the indicator of the actuation and the display 23 which constitutes a prepaid card sale machine. Moreover, in the cel (3 1), "=> -" means stopping at the current condition 3, i.e., a <condition>, and expresses that the processing time of the above-mentioned action of "(1)" is 1ms. In a cel (3 3) "an error reset and reading" The <condition 3> of having read the magnetic data of a prepaid card, Namely, in spite of being in the condition of demanding reading of magnetic data of magnetic-head 34b When the <event 3> in which the notice which shows that the writing of the magnetic data to a prepaid card was completed normally was supplied from magnetic-head 34a occurs, Action which shall judge that abnormalities have occurred in the magnetic heads 34a and 34b, and requires reading of initialization and the magnetic data for the second time from a prepaid card from the magnetic heads 34a and 34b is expressed. Moreover, in the cel (3 3), "=> -" means stopping at the current condition 3, i.e., a <condition>, and expresses that the processing time of the above-mentioned action of "(2)" is 2ms. In a cel (3 4) "an error reset and reading" The <condition 3> of having read the magnetic data of a prepaid card, Namely, in spite of being in the condition of demanding reading of magnetic data of magnetic-head 34b When the <event 4> in which the notice which shows that the writing of the magnetic data to a prepaid card was completed unusually was supplied from magnetic-head 34a occurs, Action which shall judge that abnormalities have occurred in the magnetic heads 34a and 34b, and requires reading of initialization and the magnetic data for the second time from a prepaid card from the magnetic heads 34a and 34b is expressed. Moreover, in the cel (3 4), "=> -" means stopping at the current condition 3, i.e., a <condition>, and expresses that the processing time of the above-mentioned action of "(2)" is 2ms.

[0049] In the cel (3 5), action and the processing time are not described at all. This is because it can judge that magnetic data was correctly written in the prepaid card which should issue banknotes when <the event 5> that the notice which is in the <condition 3> have read the magnetic data of a prepaid card, and shows that reading of the magnetic data from a prepaid card was completed normally was supplied from magnetic-head 34b occurs, so there is no action which should be performed especially in this cel and it is not necessary to also take especially the processing time into consideration. Moreover, in the cel (3 5), "the waiting for S=>2" expresses that a transition place is in <a condition 4>. In the cel (3 6), "reading" is in the <condition 3> have read the magnetic data of a prepaid card, and expresses action which requires reading of the magnetic data for the second time from a prepaid card which failed in reading of magnetic data from magnetic-head 34b according to generating of the <event 6> in_which of the notice which shows that reading of magnetic data was completed unusually was supplied from

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magnetic-head 34b. Moreover, in the cel (3 6), "=> -" means stopping at the current condition 3, i.e., a <condition>, and expresses that the processing time of the above-mentioned action of "(1)" is 1ms. In a cel (4 7) "motor B:OFF" In the <condition 4> of saying that it is standing by, that a detecting signal is supplied from a sensor 33 while driving a motor 37 In order to prepare for the issue-of-banknotes demand of the following prepaid card according to generating of the <event 7> in which the detecting signal of a sensor 33 changed from OFF to ON when a prepaid card passed a sensor 33 and reached issue-of-banknotes opening Action which stops the drive of a motor 37 is expressed, "=> motor A" expresses that a transition place is in <a condition 1>, and "" (0.5) expresses that the processing time of the above-mentioned action is 0.5ms.

[0050] Next, if mouse 11b and keyboard 11c which constitute a man machine interface 11 are operated and this program development equipment is made into simulation mode in order that an operator may make a simulator 18 perform the simulation for every event based on the above-mentioned state transition table based on the specification of the above-mentioned prepaid card sale machine, the simulation mode screen shown in drawing 4 will be displayed on display 11a. Hereafter, after the raw card 36 passes a sensor 32, actuation of an operator is explained to the input section 17 in the case of finding the processing time of CPU24 until it passes a sensor 33, and the list of a simulator 18 of operation with reference to the flow chart shown in drawing 5 . First, an operator directs initiation of a simulation for a simulator 18 by moving cursor to "initiation" area which was displayed on the simulation mode screen upper right portion shown in drawing 4 and which directs initiation of a simulation by the cursor key of mouse 11b or keyboard 11c, and carrying out the click of the left carbon button of a mouse, and the depression of a return key. Thereby, after state-transition judging section 18b progresses to processing of a step SA 1 and clears the contents of storage of time amount accumulation section 18c at 0ms, it progresses to a step SA 2.

[0051] Next, the inside of two or more conditions of the state transition table displayed on the simulation mode screen left-hand side which an operator shows to drawing 4 , The condition chosen as a condition in early stages of the simulation to be started from now on (in now, a motor 35 by <the that it is under [drive] saying condition 1>, and drawing 4) Cursor is moved to the display area of "Motor A" by the cursor key of mouse 11b or keyboard 11c, and the click of the left carbon button of a mouse and the depression of a return key are carried out. Since the input section 17 detects the location of the cursor in the display area in the condition that the operator chose and supplies the positional information to analysis section 18a by this, in the condition code corresponding to the location, and now, the positional information supplied from the input section 17 is changed into the condition code of <a condition 1>, and analysis section 18a supplies it to state-transition judging section 18b. Therefore, in a step SA 2, after state-transition judging section 18b's setting the condition (in the case of now <condition 1>) corresponding to the condition code supplied from analysis section 18a as an initialization condition as 18d of condition storing sections and making it display it on display 11a, it progresses to a step SA 3.

[0052] Next, an operator moves cursor to the display area of the event which wishes to generate among two or more events of the state transition table displayed on the simulation mode screen left-hand side shown in drawing 4 by the cursor key of mouse 11b or keyboard 11c, and does the click of the left carbon button of a mouse, and the depression of a return key. Since the input section 17 detects the location of the cursor in the area of the event which the operator chose and supplies the positional information to analysis section 18a by this, analysis section 18a changes into the event code corresponding to the location the positional information supplied from the input section 17, and supplies it to state-transition judging section 18b. The <event 2> (in drawing 4) in which in now the detecting signal of a sensor 32 changed from OFF to ON when the raw card 36 passed [an operator] a sensor 32 If cursor is moved to the display area of "S1:OFF->ON" by the cursor key of mouse 11b or keyboard 11c and the click of the left carbon button of a mouse and the depression of a return key are carried out Since the input section 17 detects the location of the cursor in the display area of <an event 2> and supplies the positional information to analysis section 18a, analysis section 18a changes into the event code of the <event 2> corresponding to the location the positional information supplied from the input section 17, and supplies it to state-transition judging section 18b. At a step SA 3, state-transition judging

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section 18b judges whether termination of a simulation was directed by an operator's moving cursor to "termination" area which was displayed on the simulation mode screen upper right portion shown in drawing 4 and which directs termination of a simulation by the cursor key of mouse 11b or keyboard 11c, and carrying out the click of the left carbon button of a mouse, and the depression of a return key. When this decision result is "YES", state-transition judging section 18b ends simulation processing. On the other hand, when the decision result of a step SA 3 is "NO" (i.e., when termination of a simulation is not directed by the operator), state-transition judging section 18b progresses to a step SA 4. Since the event code of <an event 2> is supplied to state-transition judging section 18b in now, the decision result of a step SA 3 serves as "NO", and state-transition judging section 18b progresses to a step SA 4. State-transition judging section 18b judges whether the code supplied from analysis section 18a is an event code at a step SA 4. When this decision result is "NO", it returns to a step SA 3. On the other hand, when the decision result of a step SA 4 is "YES" (i.e., when the code supplied from analysis section 18a is an event code), state-transition judging section 18b progresses to a step SA 5. Since the event code of <an event 2> is supplied to state-transition judging section 18b in now, the decision result of a step SA 4 serves as "YES", and state-transition judging section 18b progresses to a step SA 5.

[0053] At a step SA 5, state-transition judging section 18b progresses to a step SA 6, after determining a corresponding cel with reference to the state transition table read from the state-transition-table storage section 13 based on the condition of being stored in the event and 18d of condition storing sections corresponding to the event code supplied from analysis section 18a. Since <the condition 1> is stored in 18d of condition storing sections while the event code of <an event 2> is supplied from analysis section 18a in now, state-transition judging section 18b determines a cel (1 2) with reference to a state transition table. In addition, although a cel (1 3) is determined by processing of a step SA 5 when it wishes for generating of the event in which the notice an operator indicates it to be that the writing of <an event 3, i.e., magnetic data,> was completed normally was supplied from magnetic-head 34a Since "/" which means performing no action and not performing a state transition, either in a cel (1 3) is described, state-transition judging section 18b Steps SA6-SA8 shown below are not processed, and it stands by until return and the following event are inputted into a step SA 4 through a step SA 3. At a step SA 6, after state-transition judging section 18b reads the processing time corresponding to the action concerned from the processing-time storage section 14 and accumulates it to time amount accumulation section 18c while it checks the function of action processed in the cel determined by processing of a step SA 5, it progresses to a step SA 7. While stopping the drive of a motor 35 by which state-transition judging section 18b is processed in a cel (1 2) in now and making a motor 37 drive While checking the function of action to require the writing of magnetic predetermined data of magnetic-head 34a After adding to the accumulation time amount (0ms) to current [which reads the processing time (4ms) corresponding to the action concerned from the processing-time storage section 14, and is memorized by time amount accumulation section 18c], time amount accumulation section 18c is made to memorize. At a step SA 7, after state-transition judging section 18b reads the condition of the transition place described by the cel determined by processing of a step SA 5 from the state-transition-table storage section 13 and stores it in 18d of condition storing sections, it progresses to a step SA 8. now -- a case -- a cel (1 2) -- **** -- transition -- the point -- < -- a condition -- two -- > -- it is -- things -- expressing -- "-- = -- > -- writing -- inside -- " -- describing -- having -- **** -- since -- a state transition table -- storage -- the section -- 13 -- < -- a condition -- two -- > -- memorizing -- having -- **** -- a sake -- a state transition -- a judgment -- the section -- 18 -- b -- < -- a condition -- two -- > -- a state transition table -- storage -- the section -- 13 -- from -- reading -- appearance -- carrying out -- a condition -- storing -- the section -- 18 -- d -- memorizing -- making . At a step SA 8, after state-transition judging section 18b's supplying the accumulation time amount accumulated by time amount accumulation section 18c and the condition of the transition place stored in 18d of condition storing sections to a man machine interface 11 and making it display them on display 11a, it returns to a step SA 3. Since in now "4ms" is accumulated by time amount accumulation section 18c as accumulation time amount and <the condition 2> is memorized as a condition of a transition place by 18d of condition storing sections, as these show drawing 4 , it is displayed on display 11a of a man machine interface 11. And state-transition judging section 18b repeats

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processing of steps SA4-SA8 mentioned above until the decision result of a step SA 3 serves as "NO."
[0054] As an event an operator expects generating next, if "write-in :O.K."3, i.e., a <event>, is chosen From the condition of the transition place of a front simulation result being in <a condition 2> A cel (2 3) is determined, the accumulation time amount "5ms" by which "1ms" was added to time amount accumulation section 18c is memorized, and the condition 3 of a transition place "under motor B:reading", i.e., a <condition>, is memorized by 18d of condition storing sections. as the event similarly an operator expects generating next -- ", although a cel (3 5) will be determined since the condition of the transition place of a front simulation result is in <a condition 3> if it reads and :O.K."5, i.e., a <event>, is chosen Since the processing time is not described by the cel (3 5), front accumulation time amount "5ms" is maintained as it is by time amount accumulation section 18c, and the condition 4 of a transition place "the waiting for S2", i.e., a <condition>, is memorized by 18d of condition storing sections. Furthermore, as an event an operator expects generating next, if "S2:OFF->ON"7, i.e., a <event>, is chosen From the condition of the transition place of a front simulation result being in <a condition 4> A cel (4 7) is determined, the accumulation time amount "5.5ms" by which "0.5ms" was added to time amount accumulation section 18c is memorized, and the condition 1 of a transition place "Motor A", i.e., a <condition>, is memorized by 18d of condition storing sections.
[0055] The accumulation time amount "5.5ms" acquired by actuation of the simulator 18 explained above is the processing time which CPU24 processes, while a cel (1 2) -> cel (2 3) -> cel (3 5) -> cel (4 7) and a condition change. On the other hand, after a prepaid card passes a sensor 32, time amount until it passes a sensor 33 is determined by physical factors, such as a rotational frequency of a motor 37, and migration length of torque or a prepaid card, for example, presupposes that it is "10**1ms" in a design specification. Consequently, it turns out that processing of CPU is completed among 10ms when a prepaid card passes the card conveyance device 31. Moreover, the writing and reading to the prepaid card of magnetic data go wrong by a unit of 1 time, respectively. In order to carry out the simulation of the case where processing of re-writing and processing of re-reading are performed A cel (1 2) -> cel (2 3) -> the cel mentioned above (3 5) -> drawing 3 shows that a cel (2 4) (action called re-writing) and a cel (3 6) (action called re-reading) need to add at transition in the condition of calling it a cel (4 7). Thereby, accumulation time amount is set to "9.5ms." Consequently, it will turn out that 9ms of minimums of a design specification is not filled, and an operator will improve the program of CPU24, and layout of the card conveyance device 31.
[0056] Then, it checks whether after being in the tolerance of specification and changing the processing time described by each cel of the state transition table which an operator operates mouse 11b and keyboard 11c, referring to display 11a which constitutes a man machine interface 11, and is shown in drawing 3 , a simulator 18 is made to perform a simulation again, when a simulation is not performed as a design specification, and a simulation is performed as a design specification. Although the above explanation showed the example which an operator chooses an event for every event by mouse 11b or keyboard 11c, and makes perform a simulation, when performing a simulation next by establishing a means to memorize the sequence (henceforth an incoming-event log) of the event chosen as the input section 17, a simulation can also be performed using an incoming-event log.
[0057] Thus, since according to the configuration of this example the processing time for every action described by each cel of a state transition table can be set up and the simulation of a system can be performed based on it, the simulation based on specification in the phase of a basic design becomes possible, and shortening and upgrading of a development cycle can be realized.
[0058] B. Explain the 2nd example, next 2nd example. Drawing 6 is the block diagram showing the electric configuration of the program development equipment which is the 2nd example of this invention. The outline configuration of the program development equipment of this example is carried out from a man machine interface 41, an editor 42, the state-transition-table storage section 43, the processing-time storage section 44, the overhead-time storage section 45, the trial script storage section 46, a radionuclide generator 47, the program store section 48, the event input section 49, a simulator 50, and the simulation result storage section 51.
[0059] A man machine interface 41 consisting of display 41a, mouse 41b, keyboard 41c, etc., and an

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operator referring to the display of display 41a data (a condition --) required in order to operate mouse 41b and keyboard 41c and to create a state transition table While being used in order to input the event for performing the simulation based on the state transition table of the real-time control system designed by the state transition table etc. into overhead times, such as an event, action, a transition place, and the processing time, and a simulator 50 The simulation results (the condition of a transition place, accumulation time amount, etc.) by which reading appearance is carried out from the simulation result storage section 51 are displayed on display 41a. Here, an overhead time means the time amount taken to change from a certain condition or a certain action to other conditions or actions. For example, when CPU detects an interruption request, the time amount required in addition to action described by each cel is required for saving the contents of the register inside CPU at a stack (PUSH), setting the address of an interrupt place to a program counter, and fetching the program of an interrupt place etc. This is an overhead time. In addition, this overhead time is required similarly, when returning from interrupt processing. In the 1st above-mentioned example, since it was a rough simulation, this overhead time was not taken into consideration, but in this example, in order to perform the simulation more near a mounting condition, it is taking into consideration. Suppose that it is an overhead time 0.5ms uniformly in this example.

[0060] An editor 42 memorizes the data about a state transition table, the processing time, and an overhead time in the state-transition-table storage section 43, the processing-time storage section 44, and the overhead-time storage section 45 which correspond, respectively while it is based on the condition of having been inputted using the man machine interface 41, an event, action, a transition place, the processing time, etc. and creates and edits a state transition table. Moreover, an editor 42 creates and edits the trial script file for making a simulator 50 perform a simulation based on the event for performing the simulation inputted using the man machine interface 41 etc., and memorizes it in the trial script storage section 46. Here, a trial script file means the file of the timing chart format which described the generating timing of each event, the timing to which the component of a real-time control system should operate on specification, text format, or message inspection sequence chart format in order to make a simulator 50 perform the simulation based on the state transition table of the real-time control system designed by the state transition table. In this example, the trial script file of the text format shown in drawing 7 is used as a trial script file.

[0061] The state-transition-table storage section 43, the processing-time storage section 44, the overhead-time storage section 45, and the trial script storage section 46 consist of a storage which all has large-scale storage capacity, such as semiconductor memory, such as RAM, FD, and HD, and the data about a state transition table, the processing time, an overhead time, and a trial script file are memorized, respectively. A radionuclide generator 47 generates automatically the program (source program) described with the programming language which should be built into a real-time control system based on the data about the state transition table by which reading appearance was carried out from the state-transition-table storage section 43, and memorizes it in the program store section 48. The program store section 48 consists of a storage which has large-scale storage capacity, such as semiconductor memory, such as RAM, FD, and HD, and a source program is memorized.

[0062] The event input section 49 reads a trial script storage section 46 blank-test script file, and supplies it to a simulator 50. The outline configuration of the simulator 50 is carried out from event analysis section 50a, state-transition judging section 50b, time amount accumulation section 50c, and 50d of condition storing sections and time amount comparator 50e. Event analysis section 50a creates the event input sequence (refer to drawing 9) which rearranges into the time order which generates two or more events of the trial script file supplied from the event input section 49, and is mentioned later, and supplies it to state-transition judging section 50b. State-transition judging section 50b determines a corresponding cel with reference to the state transition table by which reading appearance was carried out from the state-transition-table storage section 43 based on the condition of being stored in the event input sequence and 50d of condition storing sections supplied from event analysis section 50a while controlling each component of the simulator 50 interior. Moreover, state-transition judging section 50b reads the overhead time taken to change to the condition of having been directed as a transition place

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from the condition in the cel concerned from the overhead-time storage section 45, and accumulates it to time amount accumulation section 50c while it reads the processing time corresponding to action processed in the determined cel from the processing-time storage section 44 and accumulates it to time amount accumulation section 50c. Furthermore, state-transition judging section 50b memorizes in the simulation result storage section 51 after simulation termination by making into a simulation result the accumulation time amount accumulated by time-amount accumulation section 50c and the condition of the transition place stored in 50d of condition storing sections while it reads the condition of the transition place described by the cel which self determined from the state-transition-table storage section 43 and stores it in 50d of condition storing sections. Time amount accumulation section 50c and 50d of condition storing sections all consist of semiconductor memory, such as RAM, and the condition of accumulation time amount and a transition place is memorized, respectively.

[0063] Time amount comparator 50e subtracts the accumulation time amount by which current storage is carried out to time amount accumulation section 50c from the generating time of day of an event with the event input sequence which event analysis section 50a created, and when a subtraction result is positive, it adds it to the accumulation time amount by which current storage is carried out by making the subtraction result into between difference minutes at time amount accumulation section 50c. Here, between difference minutes is explained. When the instruction which exists in order to make the processing which has CPU in a peripheral device perform is issued, compared with the time amount usually taken for CPU to supply the instruction concerned to a peripheral device, the time amount taken for a peripheral device to perform the processing concerned in response to the instruction concerned is long. This time difference is called between difference minutes. For example, the time amount taken for CPU24 to perform the action "motor A:ON" of the cel (1 1) of the state transition table shown in drawing 3 will require the time amount for 5ms, before the raw card 36 is picked out from a stacker 29 by the card fetch device 30 and reaches a sensor 32 to being 1ms based on the instruction of CPU24 including an overhead time. The time amount of these 5ms is not physically decided from the constraint on the structure of the card fetch device 30, and unless the drive capacity of a motor 35, the passage distance of a card, etc. are changed, it does not change. 1ms of processing times of this CPU24 and 5ms [of processing times of the card fetch device 30] time difference is between difference minutes. In the 1st above-mentioned example, although it was the simulation which took only the processing time of CPU into consideration chiefly, if not only the processing time of CPU but the operating time of the peripheral device is not taken into consideration, the simulation more near a mounting condition cannot be performed with the real-time control system in which the program which is the object of development is carried. Then, in this example, the simulation in consideration of between difference minutes is performed. The simulation result which the simulation result storage section 51 consists of a storage which has large-scale storage capacity, such as semiconductor memory, such as RAM, FD, and HD, and consists of a condition of accumulation time amount and a transition place is memorized.

[0064] Next, actuation of the program development equipment of the above-mentioned configuration is explained. First, the program which should be developed with this program development equipment is a program included in the prepaid card sale machine shown in drawing 2 like the 1st above-mentioned example, and also makes specification of a prepaid card sale machine be the same as that of the 1st example. Referring to the display of display 41a which constitutes a man machine interface 41, he operates mouse 41b and keyboard 41c, and an operator inputs data (a condition, an event, action, a transition place, processing time, etc.) required in order to create a state transition table based on actuation and specification of the above-mentioned prepaid card sale machine. While displaying on display 41a from which an editor 42 creates a state transition table, and constitutes a man machine interface 41 by this, a state transition table and the processing time are memorized to each predetermined storage region of the state-transition-table storage section 43 and the processing-time storage section 44. In addition, since the state transition table is the same as the state transition table (refer to drawing 3) in the 1st above-mentioned example, the explanation is omitted.

[0065] Next, an operator inputs the data (henceforth simulation data) of the event shown below, and its generating timing and others in order to operate mouse 41b and keyboard 41c and to make a simulator

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50 perform the simulation based on the above-mentioned state transition table based on the specification of the above-mentioned prepaid card sale machine, referring to the display of display 41a which constitutes a man machine interface 41. That is, when an early condition is in the <condition 1> of the directions waiting of the prepaid card issue of banknotes, the <event 2> of the detecting signal of a sensor 32 changing from OFF to ON after generating of the <event 1> of the issue-of-banknotes demand of a prepaid card and 5ms, and changing to OFF again after the 1ms shall occur. Moreover, magnetic-head 34a shall notify that the actuation ended the demand of the writing of magnetic data normally after a carrier beam and 1ms, and magnetic-head 34b shall notify that the actuation ended the demand of reading of magnetic data normally after a carrier beam and 1ms, namely, <an event 3> and <an event 5> shall occur, respectively. Furthermore, the <event 7> of the detecting signal of a sensor 33 changing from a sensor 33 to ON from OFF after generating of <an event 1> and 15ms in the <condition 4> that it is referred to as standing by that a detecting signal is supplied, and changing to OFF again after the 1ms shall occur. Moreover, an operator inputs the data (henceforth identity data) about the operating state which should exist on the layout shown below, in order to operate mouse 41b and keyboard 41c and to compare with the above-mentioned simulation result, referring to the display of display 41a which similarly constitutes a man machine interface 41. That is, on specification, a motor 35 is driven until it passes for 5ms since the time of generating of <an event 1>, and a motor 37 presupposes that it should drive only until after [of an after / generating of <an event 1>, and 5ms] 14 - 16ms. In an editor 42, after the simulation data and identity data which were explained above are edited into the trial script file of text format as shown in drawing 7 , they are memorized by the trial script storage section 46. In drawing 7 , "InitialState:ST1" expresses that the initial state at the time of simulation initiation is in <a condition 1>. Meaning [for example,] generating of an event without change of a condition in "Event:", "C_RQ" means that it is the issue-of-banknotes demand of a prepaid card. Moreover, the components with which "Object:" is indicated after ":", equipment, etc. express that they are a simulation or the object of verification in the paragraph concerned. For example, "S1" means describing the change of state of a sensor 32. The data of the paragraph concerned expresses whether "Property:" is simulation data (TEST) or it is identity data (VERIFY). It expresses whether the time amount of the change of state which expresses "Time:" to the line under it is absolute time (ABS), or it is relative time amount (REL). In addition, "ABS (0)" in the paragraph of "Event:C_RQ" means generating the event of the issue-of-banknotes demand of a prepaid card at 0ms of absolute time. "From:" and "To:" mean the transfer place the generating origin of an event, respectively. The passage of time expresses how as for "StateChange:", the condition of the object concerned changes with the sentences after ":", for example, for 0ms, although "0(OFF)->5(ON)->6 (OFF)" is in an OFF condition at o'clock, it will be in ON condition in 5ms, and it means returning to an OFF condition again after 6ms. In addition, this trial script file shall be created in consideration of between the above-mentioned difference minutes.

[0066] Next, if mouse 41b and keyboard 41c which constitute a man machine interface 41 are operated and this program development equipment is made into simulation mode in order that an operator may make a simulator 50 perform the simulation based on the above-mentioned state transition table based on the specification of the above-mentioned prepaid card sale machine, the simulation mode window in which "initiation" area which directs initiation of a simulation to display 41a was established will be displayed. Hereafter, after the purchaser of a prepaid card pushes the card issue-of-banknotes directions carbon button (illustration abbreviation) of actuation and a display 23, actuation of the simulator 50 in the case of finding the processing time of CPU24 until a prepaid card is issued, and actuation of an operator are explained with reference to the flow chart shown in drawing 8 . First, an operator directs initiation of a simulation for a simulator 50 by moving cursor to "initiation" area which was displayed on the simulation mode window and which directs initiation of a simulation by the cursor key of mouse 11b or keyboard 11c, and carrying out the click of the left carbon button of a mouse, and the depression of a return key. Thereby, after state-transition judging section 50b progresses to processing of a step SB 1 and clears the contents of storage of time amount accumulation section 50c at 0ms, it progresses to a step SB 2. At a step SB 2, after state-transition judging section 50b reads the sentence of the head of the trial script file supplied from the event input section 49 and sets the condition of corresponding, as an

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initialization condition as 18d of condition storing sections, it progresses to a step SB 3. Since "InitialState:ST1" is described as a top sentence by the trial script file shown in drawing 7 in now, <a condition 1> is set as 50d of condition storing sections as an initialization condition.

[0067] that state-transition judging section 50b has the trial script file which should be inputted into event analysis section 50a from the event input section 49 at a step SB 3 ****** -- ******** -- it judges. When the decision result of a step SB 3 is "YES" (i.e., when there is a trial script file which should be inputted into event analysis section 50a from the event input section 49), state-transition judging section 50b progresses to a step SB 4, after making the trial script file input into event analysis section 50a from the event input section 49. Since the trial script file shown in drawing 7 is memorized by the trial script storage section 46 in now, the decision result of a step SB 3 serves as "YES", and state-transition judging section 50b makes the trial script file input into event analysis section 50a from the event input section 49. At a step SB 4, after event analysis section 50a creates the event input sequence (refer to drawing 9) rearranged into the time order which generates two or more events of the trial script file inputted from the event input section 49 and supplies it to state-transition judging section 50b, it progresses to a step SB 5. In now, the event input sequence shown in drawing 9 from the trial script file shown in drawing 7 is created.

[0068] At a step SB 5, state-transition judging section 50b judges whether an event input sequence is read into the early order of time amount from event analysis section 50a, and there is any event which should be generated. It progresses to a step SB 6, after incorporating the event in which time amount is the earliest, and its generating time of day, among the events which should be generated, when this decision result is "YES." When the decision result of a step SB 5 is "NO" on the other hand (i.e., when there is no event which an event input sequence is scanned [event] from the earlier one of time amount, and is not still generating it), it judges that the simulation based on one trial script file was completed, and judges whether there is any trial script file which should be examined to return and a degree to a step SB 3. In now, it is the beginning of the simulation based on the trial script file shown in drawing 7 , and since there is an event which should be generated in a reading ****** event input sequence from event analysis section 50a, the decision result of a step SB 5 serves as "YES", and state-transition judging section 50b progresses to a step SB 6, after incorporating "C_RQ" which is the earliest event of the event input sequence of drawing 9 , and its generating time of day (0ms). At a step SB 6, state-transition judging section 50b judges whether it is the no from which the incorporated event is set as the object of a simulation with reference to the state transition table read from the state-transition-table storage section 13. When this decision result is "NO", state-transition judging section 50b returns to a step SB 5. On the other hand, when the decision result of a step SB 6 is "YES" (i.e., when [which the incorporated event should describe to a state transition table] it is that event and is set as the object of a simulation by shifting), state-transition judging section 50b progresses to a step SB 7. Since in now the event "C_RQ" is described by the state transition table as <an event 1> and is set as the object of a simulation, the decision result of a step SB 6 serves as "YES." At a step SB 7, time amount comparator 50e subtracts the accumulation time amount by which current storage is carried out to time amount accumulation section 50c from the generating time of day of the event which state-transition judging section 50b incorporated, and a subtraction result is positive or it judges whether there is between difference minutes. When this decision result is "NO", time amount comparator 50e progresses to a step SB 9. On the other hand, when the decision result of a step SB 7 is "YES" (i.e., when there is between difference minutes), it progresses to a step SB 8. since it is not a thing about the instruction for making the processing which in now <whose event 1> is an event of the issue-of-banknotes demand of a prepaid card, and has CPU24 in a peripheral device perform -- difference -- there is no time amount, the decision result of a step SB 7 serves as "NO", and time amount comparator 50e progresses to a step SB 9. At a step SB 8, after time amount comparator 50e adds between difference minutes to the accumulation time amount by which current storage is carried out at time amount accumulation section 50c and makes time amount accumulation section 50c memorize the addition result, it progresses to a step SB 9.

[0069] At a step SB 9, state-transition judging section 50b progresses to a step SB 10, after determining a corresponding cel with reference to the state transition table read from the state-transition-table storage

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section 13 based on the condition of being stored in the event and 18d of condition storing sections incorporated from event analysis section 50a. Since <the condition 1> is stored in 50d of condition storing sections while having incorporated <the event 1> from event analysis section 50a in now, state-transition judging section 50b determines a cel (1 1) with reference to a state transition table. At a step SB 10, it progresses to a step SB 11, after adding state-transition judging section 50b to the accumulation time amount which reads an overhead time from the overhead-time storage section 45, and is memorized by time amount accumulation section 50c and making time amount accumulation section 50c memorize the addition result. After adding to the accumulation time amount (0ms) to current [which state-transition judging section 50b reads an overhead time (0.5ms) from the overhead-time storage section 45 in now, and is memorized by time amount accumulation section 50c], time amount accumulation section 50c is made to memorize an addition result (0.5ms). At a step SB 11, after state-transition judging section 50b adds to the accumulation time amount which reads the processing time corresponding to the action concerned from the processing-time storage section 44, and is memorized by time amount accumulation section 50c and makes time-amount accumulation section 50c memorize the addition result while it checks the function of action processed in the cel determined by processing of a step SB 9, it progresses to a step SB 12. While state-transition judging section 50b checks the function of action processed in a cel (1 1) to make a motor 35 drive in now After adding to the accumulation time amount (0.5ms) to current [which reads the processing time (0.5ms) corresponding to the action concerned from the processing-time storage section 44, and is memorized by time amount accumulation section 50c], time amount accumulation section 50c is made to memorize an addition result (1ms). At a step SB 12, after state-transition judging section 50b reads the condition of the transition place described by the cel determined by processing of a step SB 9 from the state-transition-table storage section 43 and stores it in 50d of condition storing sections, it progresses to a step SB 13. Since the transition place is not described by the cel (1 1) in now, a transition place is not changed but <a condition 1> is memorized by 18d of condition storing sections. At a step SB 13, after memorizing state-transition judging section 50b in the simulation result storage section 51 by making into a simulation result the accumulation time amount accumulated by time amount accumulation section 50c and the condition of the transition place stored in 50d of condition storing sections, it returns to a step SB 5. In now, accumulation time amount (1ms) and the condition (<condition 1>) of a transition place are memorized by the simulation result storage section 51 as a simulation result. On the other hand, when the decision result of a step SB 3 is "NO" (i.e., when the trial script file continued from the event input section 49 to event analysis section 50a is not inputted), it judges that the simulation based on all the trial script files memorized by the trial script storage section 46 ended state-transition judging section 50b, and progresses to a step SB 14. At a step SB 14, after state-transition judging section 50b reads the simulation result memorized by the simulation result storage section 51 and supplies it to a man machine interface 41, it ends simulation processing. Thereby, an old simulation result is displayed on display 41a of a man machine interface 41.

[0070] The simulation corresponding to them is explained to the generating list of the event which time amount early to the degree of the event "C_RQ" of the event input sequence shown in drawing 9 should be made to generate hereafter, and the event after it. In addition, although explained below, without touching on processing of each step of the flow chart shown in drawing 8 , after processing of the above-mentioned steps SB3-SB13 is repeated, it cannot be overemphasized that processing of a step SB 14 is performed at the last. First, state-transition judging section 50b incorporates an event "S1:OFF->ON" and its generating time of day (5ms) with reference to the event input sequence shown in drawing 9 . Since this event "S1:OFF->ON" is described as <an event 2> by the state transition table shown in drawing 3 and is set as the object of a simulation, time amount comparator 50e subtracts the accumulation time amount (1ms) memorized by time amount accumulation section 50c now from the generating time of day (5ms) of <an event 2>. since this subtraction result is positive (4ms) -- time amount comparator 50e -- difference -- after adding time amount (4ms) to the accumulation time amount (1ms) by which current storage is carried out at time amount accumulation section 50c, time amount accumulation section 50c is made to memorize that addition result (5ms) Next, state-transition judging

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section 50b refers to the state transition table shown in drawing 3 based on the condition (<condition 1>) of being stored in <the event 2> and 18d of condition storing sections incorporated from event analysis section 50a. After adding to the accumulation time amount (5ms) to current [which reads an overhead time (0.5ms) from the overhead-time storage section 45, and is memorized by time amount accumulation section 50c after determining a cel (1 2)], time amount accumulation section 50c is made to memorize an addition result (5.5ms). Next, while state-transition judging section 50b checks the function of action called a drive halt of a motor 35 processed in a cel (1 2), the drive of a motor 37, and the write-in demand of the magnetic data to magnetic-head 34a It adds to the accumulation time amount (5.5ms) to current [which reads the processing time (4ms) from the processing-time storage section 44, and is memorized by time amount accumulation section 50c], and time amount accumulation section 50c is made to memorize the addition result (9.5ms). Next, the accumulation time amount accumulated by time amount accumulation section 50c after state-transition judging section 50b's having read the condition (<condition 2>) of the transition place described by the cel (1 2) from the state-transition-table storage section 43 and storing in 50d of condition storing sections (9.5ms), It memorizes in the simulation result storage section 51 by making into a simulation result the condition (<condition 2>) of the transition place stored in 50d of condition storing sections.

[0071] Next, state-transition judging section 50b refers to the event input sequence shown in drawing 9 . Although an event "S1:ON->OFF" and its generating time of day (6ms) are incorporated, since this event "S1:ON->OFF" is not described by the state transition table shown in drawing 3 and is not set as the object of a simulation With reference to the event input sequence again shown in drawing 9 , an event "write-in O.K." and its generating time of day (*) are incorporated. Although this event "write-in O.K." is described as <an event 3> by the state transition table shown in drawing 3 and is set as the object of a simulation, since it means performing generating time of day (*) succeedingly to pre-processing, there is nothing between difference minutes. Next, state-transition judging section 50b refers to the state transition table shown in drawing 3 based on the condition (<condition 2>) of being stored in <the event 3> and 18d of condition storing sections incorporated from event analysis section 50a. After adding to the accumulation time amount (9.5ms) to current [which reads an overhead time (0.5ms) from the overhead-time storage section 45, and is memorized by time amount accumulation section 50c after determining a cel (2 3)], time amount accumulation section 50c is made to memorize an addition result (10ms). Next, while state-transition judging section 50b checks the function of action of requiring reading of the magnetic data of a prepaid card processed in a cel (2 3) of magnetic-head 34b It adds to the accumulation time amount (10ms) to current [which reads the processing time (1ms) from the processing-time storage section 44, and is memorized by time amount accumulation section 50c], and time amount accumulation section 50c is made to memorize the addition result (11ms). Next, the accumulation time amount accumulated by time amount accumulation section 50c after state-transition judging section 50b's having read the condition (<condition 3>) of the transition place described by the cel (2 3) from the state-transition-table storage section 43 and storing in 50d of condition storing sections (11ms), It memorizes in the simulation result storage section 51 by making into a simulation result the condition (<condition 3>) of the transition place stored in 50d of condition storing sections.

[0072] Next, state-transition judging section 50b incorporates an event "reading O.K." and its generating time of day (*) with reference to the event input sequence shown in drawing 9 . Although this event "reading O.K." is described as <an event 5> by the state transition table shown in drawing 3 and is set as the object of a simulation, since it means performing generating time of day (*) succeedingly to pre-processing, there is nothing between difference minutes. Next, state-transition judging section 50b refers to the state transition table shown in drawing 3 based on the condition (<condition 3>) of being stored in <the event 5> and 18d of condition storing sections incorporated from event analysis section 50a. After adding to the accumulation time amount (11ms) to current [which reads an overhead time (0.5ms) from the overhead-time storage section 45, and is memorized by time amount accumulation section 50c after determining a cel (3 5)], time amount accumulation section 50c is made to memorize an addition result (11.5ms). Next, although a check does not function action since state-transition judging section 50b does not have action processed in a cel (3 5), it is added to the accumulation time amount (11.5ms) to current

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[which reads the processing time (0ms) from the processing-time storage section 44, and is memorized by time amount accumulation section 50c], and makes time amount accumulation section 50c memorize the addition result (11.5ms). Next, after state-transition judging section 50b's reading the condition (<condition 4>) of the transition place described by the cel (3 5) from the state-transition-table storage section 43 and storing in 50d of condition storing sections, It memorizes in the simulation result storage section 51 by making into a simulation result the accumulation time amount (11.5ms) accumulated by time amount accumulation section 50c and the condition (<condition 4>) of the transition place stored in 50d of condition storing sections.

[0073] Next, state-transition judging section 50b incorporates an event "S2:OFF->ON" and its generating time of day (15ms) with reference to the event input sequence shown in drawing 9 . Since this event "S2:OFF->ON" is described as <an event 7> by the state transition table shown in drawing 3 and is set as the object of a simulation, time amount comparator 50e subtracts the accumulation time amount (11.5ms) memorized by time amount accumulation section 50c now from the generating time of day (15ms) of <an event 7>. since this subtraction result is positive (3.5ms) -- time amount comparator 50e -- difference -- after adding time amount (3.5ms) to the accumulation time amount (15ms) by which current storage is carried out at time amount accumulation section 50c, time amount accumulation section 50c is made to memorize that addition result (15ms)

[0074] Next, state-transition judging section 50b refers to the state transition table shown in drawing 3 based on the condition (<condition 4>) of being stored in <the event 7> and 18d of condition storing sections incorporated from event analysis section 50a. After adding to the accumulation time amount (15ms) to current [which reads an overhead time (0.5ms) from the overhead-time storage section 45, and is memorized by time amount accumulation section 50c after determining a cel (4 7)], time amount accumulation section 50c is made to memorize an addition result (15.5ms). Next, state-transition judging section 50b is added to the accumulation time amount (15.5ms) to current [which reads the processing time (0.5ms) from the processing-time storage section 44, and is memorized by time amount accumulation section 50c], and makes time amount accumulation section 50c memorize the addition result (16ms) while it checks the function of action called a drive halt of a motor 37 processed in a cel (4 7). Next, the accumulation time amount accumulated by time amount accumulation section 50c after state-transition judging section 50b's having read the condition (<condition 1>) of the transition place described by the cel (4 7) from the state-transition-table storage section 43 and storing in 50d of condition storing sections (16ms), It memorizes in the simulation result storage section 51 by making into a simulation result the condition (<condition 1>) of the transition place stored in 50d of condition storing sections. Next, although state-transition judging section 50b incorporates an event "S2:ON->OFF" and its generating time of day (16ms) with reference to the event input sequence shown in drawing 9 , since this event "S2:ON->OFF" is not described by the state transition table shown in drawing 3 and is not set as the object of a simulation, the event input sequence again shown in drawing 9 is referred to. However, since it was made to generate about all the events of the event input sequence shown in drawing 9 , it is judged that the simulation based on one trial script file ended state-transition judging section 50b.

[0075] The simulation explained above is the example in which each the writing and reading to the prepaid card of magnetic data succeeded at once, and transition of a condition serves as a cel (1 1) -> cel (1 2) -> cel (2 3) -> cel (3 5) -> cel (4 7). This will be called the simulation result 1. Next, the writing and reading to the prepaid card of magnetic data go wrong by a unit of 1 time, respectively, and if the simulation of the case where processing of re-writing and processing of re-reading are performed is carried out, transition of a condition will serve as a cel (1 1) -> cel (1 2) -> cel (2 4) -> cel (2 3) -> cel (3 6) -> cel (3 5) -> cel (4 7). Here, although the actuation of a simulator 50 based on the trial script file in such a case, an event input sequence, and it is not explained, accumulation time amount (16.5ms) is acquired by the same processing as the above-mentioned case. This will be called the simulation result 2. and two trial script files about these two simulations are beforehand memorized by the trial script storage section 46, and simulation processing is ended after state-transition judging section 50b's carrying out reading appearance of the simulation result memorized by the simulation result storage

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section 51 after the simulation which is alike, respectively and is based is completed, and supplying a man machine interface 41. Thereby, as shown in drawing 10 , an old simulation result is displayed on display 41a of a man machine interface 41 as a timing chart. Drawing 10 (a) The wave of the simulation data about the generating timing of the <event 1> of a state transition table which shows - (e) in drawing 3 , respectively, <an event 2>, <an event 3>, <an event 5>, and a <an event 7>, drawing 10 (f), and (g) are the waves of the identity data about the generating timing of a driving signal which should drive a motor 35 (MotorA) and a motor 37 (MotorB), respectively These are created from the trial script file shown in drawing 7 . Moreover, drawing 10 (h) and (i) express the simulation result 1 and the simulation result 2, respectively, and drawing 10 (j) is a wave about the generating timing of a driving signal which should drive the motor 37 (MotorB) in the case of the simulation result 2. When drawing 10 (g) is compared with drawing 10 (j), to the tolerance of timing where the driving signal of a motor 37 (MotorB) changes from ON at OFF being 15**1ms, by drawing 10 (j), even if the driving signal of a motor 37 (MotorB) passes 16ms, it is still ON, and it turns out at drawing 10 (g) that specification is not fulfilled in the case of the simulation result 2. Then, an operator referring to the state transition table (drawing 3) currently displayed on display 41a which constitutes a man machine interface 41 based on this simulation result 2 Examine whether neither mouse 41b nor keyboard 41c can be operated, it is in the tolerance of specification, action, the processing time, etc. which are described by each cel which constitutes the state transition table concerned are changed, and the processing time of CPU24 can be shortened, or It examines whether neither the replacement to CPU with a earlier working speed nor the responsibility of magnetic-head 34a or magnetic-head 34b can be improved, and a simulation will be repeated until specification is satisfied. In addition, in the above-mentioned example, when the event which forms a step SB 6 and has not been specified to a state transition table was inputted, it was made the configuration which returns to a step SB 5, but you may constitute so that it may be made to pass without processing anything as having no applicable processing of each processing of steps SB7-SB13 without forming a step SB 6.

[0076] Thus, since the simulation of a system can be performed also in consideration of between an overhead time and a difference minute based on a state transition table while setting up the processing time for every action described by each cel of a state transition table according to the configuration of this example, the simulation based more on the mounting condition in the phase of a basic design compared with the 1st above-mentioned example becomes possible, and shortening and upgrading of a development cycle can be realized.

[0077] C. Explain the 3rd example, next the 3rd example of this invention. First, suppose that it is the same as that of the electric configuration of the program development equipment of the 2nd example shown in drawing 6 , and abbreviation about the electric configuration of program development equipment. However, it differs so that it may mention later about the function of each component. Moreover, it is the program included in the prepaid card sale machine shown in drawing 2 like the 1st above-mentioned example, and the specification of a prepaid card sale machine also makes the program which should be developed with this program development equipment be the same as that of the 1st example. In the 1st and 2nd above-mentioned examples, although each took only the processing time of CPU24 into consideration, if the processing time of peripheral devices, such as the magnetic heads 34a and 34b, is not taken into consideration, either, it cannot be said that it is a simulation adapted to a mounting condition. Then, in this example, also with actuation of the magnetic heads 34a and 34b, as shown in drawing 11 , a state transition table is created, and the simulation based on it will be related with the simulation based on the state transition table shown in drawing 3 , and will be performed. In addition, about the creation method of the state transition table shown in drawing 11 , since it is the same as that of the creation method of the state transition table shown in drawing 3 , and abbreviation, the explanation is omitted.

[0078] In the line of the maximum upper case of drawing 11 as for "the waiting for a demand", the magnetic heads 34a and 34b writing or reading of magnetic data from CPU24 The condition of the waiting for a demand The condition which means (it is hereafter called {a condition 1}) and is writing magnetic data in the raw card 36 by magnetic-head 34a "during writing" It means (it is hereafter called

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{a condition 2}), and the condition (henceforth {a condition 3}) of having read the magnetic data of a prepaid card by magnetic-head 34b is expressed "during reading." Moreover, the thing for which "writing" had the write request of the magnetic predetermined data from CPU24 to the raw card 36 in the leftmost train of drawing 11 It meant (it is hereafter called {an event 1}), and "reading" had the reading demand of the magnetic data from [from CPU24] a prepaid card. The message that meant (it is hereafter called {an event 2}) and the writing of magnetic data completed "write-in completion" on the raw card 36 by magnetic-head 34a was received. It means (it is hereafter called {an event 3}), and means that "reading completion" received the message that reading of magnetic data was completed from the prepaid card by magnetic-head 34b (henceforth {an event 4}).

[0079] Next, in the state transition table shown in drawing 11 , supposing it expresses the portion which an event and a condition intersect (cel), for example, the cel which {a condition 1} and {an event 2} intersect, as a cel [1, 2], the contents of description of each cel express the semantics shown below. First, in the cel [1, 1], "a write-in start" is in the {condition 1} of the write request waiting of the magnetic data from CPU24, and expresses action which starts the writing of the magnetic data to the raw card 36 by magnetic-head 34a according to generating of the {event 1} of the write request of magnetic data from CPU24. Moreover, in the cel [1, 1], "during => writing", it expresses that a transition place is in {a condition 2}, and "(1)" expresses that the processing time of the above-mentioned action is 1ms. Furthermore, in the cel [1, 1], "the write-in completion set" means transmitting a message called write-in completion, when the writing of the magnetic data to the raw card 36 by magnetic-head 34a is completed. In the cel [1, 2], "a reading start" is in the {condition 1} of the reading demand waiting of the magnetic data from CPU24, and expresses action which starts reading of the magnetic data from the prepaid card by magnetic-head 34b according to generating of the {event 2} of the reading demand of magnetic data from CPU24. Moreover, in the cel [1, 2], "during => reading", it expresses that a transition place is in {a condition 3}, and "(1)" expresses that the processing time of the above-mentioned action is 1ms. Furthermore, in the cel [1, 2], the "reading completion set" means transmitting a message called reading completion, when reading of the magnetic data from the prepaid card by magnetic-head 34b is completed. In the cel [1, 3] and the cel [1, 4], "x" means that the combination of such an event and a condition does not exist.

[0080] In the cel [2, 1], an "error return" is in the {condition 2} of writing magnetic data in the raw card 36 by magnetic-head 34a, and since it cannot write magnetic data in one raw card 36 at a time on specification when the {event 1} of the write request of magnetic data occurs from CPU24 further, it expresses with CPU24 action which notifies that. Moreover, in the cel [2, 1], it means that "=>-" stops at the current condition 2, i.e., a {condition}, and "" (0.5) expresses that the processing time of the above-mentioned action is 0.5ms. In the cel [2, 2], the "error return" expresses action which shall judge that abnormalities have occurred in CPU24 and notifies that to CPU24, when the {event 2} of the reading demand of magnetic data occurs from CPU24, in spite of being in the {condition 2} of writing magnetic data in the raw card 36 by magnetic-head 34a. Moreover, in the cel [2, 2], it means that "=>-" stops at the current condition 2, i.e., a {condition}, and "" (0.5) expresses that the processing time of the above-mentioned action is 0.5ms. In the cel [2, 3], "data flag set:write-in termination" is in the {condition 2} of writing magnetic data in the raw card 36 by magnetic-head 34a, and expresses action which sets the data flag of the purport which writing ended according to generating of the {event 3} in which the message that the writing of magnetic data was completed on the raw card 36 by magnetic-head 34a was received. Moreover, in the cel [2, 3], "the waiting for => demand" expresses that a transition place is in {a condition 1}, and expresses that the processing time of the above-mentioned action of "(1)" is 1ms. In the cel [2, 4], "/" performs no action but it means not performing a state transition, either. Since the semantics of "/" is the same also in a cel [3, 3], the explanation is omitted.

[0081] In the cel [3, 1], the "error return" expresses action which shall judge that abnormalities have occurred in CPU24 and notifies that to CPU24, when the {event 1} of the write request of magnetic data occurs from CPU24, in spite of being in the {condition 3} of having read magnetic data from the prepaid card by magnetic-head 34b. Moreover, in the cel [3, 1], it means that "=>-" stops at the current condition 3, i.e., a {condition}, and "" (0.5) expresses that the processing time of the above-mentioned action is

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0.5ms. In the cel [3, 2], an "error return" is in the {condition 3} of having read magnetic data from the prepaid card by magnetic-head 34b, and since it can read magnetic data at a time only from the prepaid card of one sheet on specification when the {event 2} of the reading demand of magnetic data occurs from CPU24 further, it expresses with CPU24 action which notifies that. Moreover, in the cel [2, 2], it means that "=>-" stops at the current condition 3, i.e., a {condition}, and "" (0.5) expresses that the processing time of the above-mentioned action is 0.5ms. In the cel [3, 4], "data flag set:reading termination" is in the {condition 3} of having read magnetic data from the prepaid card by magnetic-head 34b, and expresses action which sets the data flag of the purport which reading ended according to generating of the {event 4} in which the message that reading of magnetic data was completed from the prepaid card by magnetic-head 34b was received. Moreover, in the cel [3, 4], "the waiting for => demand" expresses that a transition place is in {a condition 1}, and expresses that the processing time of the above-mentioned action of "(1)" is 1ms.

[0082] Next, an operator inputs simulation data and identity data in order to operate mouse 41b and keyboard 41c and to make a simulator 50 perform the simulation based on the two above-mentioned state transition tables (drawing 3 and drawing 11) based on the specification of the above-mentioned prepaid card sale machine, referring to the display of display 41a which constitutes a man machine interface 41. In addition, about the contents of this simulation data and identity data, since it is the same as that of the 2nd above-mentioned example, that explanation is omitted. And an editor 42 creates and edits the trial script file of the timing chart format shown in drawing 12 and drawing 13 based on this simulation data and identity data, and memorizes it in the trial script storage section 46. In drawing 12 , No.1 and No.2 are [simulation data, No.3, and No.4] identity data. Moreover, in the identity data of No.4 of drawing 12 , **1 surrounded by the rectangular head expresses things that the control change over timing to OFF from ON of a motor B 37, i.e., a motor, should just be in the tolerance for **1ms centering on 15ms. In No.1 of drawing 13 , "reading" which it was square, and the surrounded "writing" meant that the write-in instruction of magnetic data was supplied from CPU to light magnetic-head, i.e., the magnetic head, 34a, was square, and was surrounded means that the reading instruction of magnetic data was supplied from CPU to lead magnetic-head, i.e., the magnetic head, 34b. Moreover, No.2 of drawing 13 mean generating interruption in CPU by supplying the notice "write-in O.K." which shows that the writing of magnetic data was normally completed after 2ms to CPU, if the write-in instruction from CPU is received. Similarly, No.3 of drawing 13 mean generating interruption in CPU by supplying the notice "reading O.K." which shows that reading of magnetic data was normally completed after 2ms to CPU, if the reading instruction from CPU is received. In addition, each of 2 above-mentionedms is not absolute time but relative time amount. In addition, about the trial script file of this timing chart format, for example, you may create using the timing chart editor program included in the editor 42, and after creating the trial script file of the text format once shown in drawing 7 , conversion and creation of may be done using the timing chart display program included in the editor 42. The latter method shall be adopted in this example. Therefore, the trial script file for making it display in the trial script file and timing chart format of text format shall be created and memorized by the trial script storage section 46.

[0083] Moreover, in the 2nd example, although it set up that an overhead time was 0.5ms uniformly, overhead times differ also before and after activation of each action for every cel of a state transition table again, if it says strictly. Then, in this invention, in order to perform the simulation based more on the mounting condition, as shown in drawing 14 , the storage area corresponding to the state transition table shown in drawing 3 shall be prepared, and an overhead time shall be memorized for every cel in the overhead-time storage section 45. In drawing 14 , "0.2/0.3", the overhead time (this is hereafter called a before overhead time) before the action activation the numeric character in front of "/" "0.2" was described to be by the cel concerned is expressed, and the overhead time (this is hereafter called an after overhead time) after the action activation the numeric character after "/" "0.3" was described to be by the cel concerned is expressed. In addition, in fact, although the magnetic heads 34a and 34b need to take an overhead time into consideration if it says strictly since it drives according to the dedication LSI which received the control signal from CPU24, they shall not have both a before overhead time and an after overhead time about the drive of the magnetic heads 34a and 34b in this example.

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[0084] next, if mouse 41b and keyboard 41c which constitute a man machine interface 41 be operate and this program development equipment be make into simulation mode in order that an operator may make a simulator 50 perform the simulation based on the two above-mentioned state transition tables (drawing 3 and drawing 11) based on the specification of the above-mentioned prepaid card sale machine, the simulation mode window in which "initiation" area which direct initiation of a simulation to display 41a be established will be display. Hereafter, after the raw card 36 passes a sensor 32, actuation of the simulator 50 in the case of finding the processing time of CPU24 until it passes a sensor 33, and the processing time of the magnetic heads 34a and 34b, and actuation of an operator are explained with reference to the flow chart shown in drawing 15 . First, an operator directs initiation of a simulation for a simulator 50 by moving cursor to "initiation" area which was displayed on the simulation mode window and which directs initiation of a simulation by the cursor key of mouse 11b or keyboard 11c, and carrying out the click of the left carbon button of a mouse, and the depression of a return key. Thereby, after state-transition judging section 50b progresses to processing of a step SC 1 and clears the contents of storage of time amount accumulation section 50c at 0ms, it progresses to a step SC 2. At a step SC 2, after state-transition judging section 50b reads the sentence of the head of the trial script file of the text format supplied from the event input section 49 and sets the condition of corresponding, as an initialization condition as 18d of condition storing sections, it progresses to a step SC 3. Since "InitialState:ST1" is described as a top sentence by the trial script file shown in drawing 7 in now, <a condition 1> is set as 50d of condition storing sections as an initialization condition.

[0085] At a step SC 3, state-transition judging section 50b judges whether it is that there is a trial script file of timing chart format which should be inputted into event analysis section 50a from the event input section 49. When the decision result of a step SC 3 is "YES" (i.e., when there is a trial script file of timing chart format which should be inputted into event analysis section 50a from the event input section 49), state-transition judging section 50b progresses to a step SC 4, after making the trial script file input into event analysis section 50a from the event input section 49. Since the trial script file shown in drawing 12 and drawing 13 is memorized by the trial script storage section 46 in now, the decision result of a step SC 3 serves as "YES", and state-transition judging section 50b makes each trial script file input into event analysis section 50a from the event input section 49. At a step SC 4, event analysis section 50a detects the wave-like changing point of each event of the trial script file of timing chart format inputted from the event input section 49, and after creating the event input sequence rearranged into the time order which generates each event and supplying state-transition judging section 50b, it progresses to a step SC 5. In now, the event input sequence (illustration abbreviation) of timing chart format is created from the trial script file of the timing chart format shown in drawing 12 and drawing 13 .

[0086] At a step SC 5, state-transition judging section 50b judges whether an event input sequence is read into the early order of time amount from event analysis section 50a, and there is any event which should be generated. It progresses to a step SC 6, after incorporating the event in which time amount is the earliest, among the events which should be generated, when this decision result is "YES." When the decision result of a step SC 5 is "NO" on the other hand (i.e., when there is no event which an event input sequence is scanned [event] from the earlier one of time amount, and is not still generating it), it judges that the simulation based on one trial script file was completed, and judges about whether there is any trial script file which should be examined to return and a degree to a step SC 3. In now, it is the beginning of the simulation based on the trial script file shown in drawing 12 and drawing 13 , and since there is an event which should be generated in a reading ****** event input sequence from event analysis section 50a, the decision result of a step SC 5 serves as "YES", and state-transition judging section 50b progresses to a step SC 6, after incorporating "S1:OFF->ON" which is the earliest event of an event input sequence. At a step SC 6, state-transition judging section 50b judges whether it is the no from which the incorporated event is set as the object of a simulation with reference to the state transition table read from the state-transition-table storage section 13. When this decision result is "NO", state-transition judging section 50b returns to a step SC 5. On the other hand, when the decision result of a step SC 6 is "YES" (i.e., when [which the incorporated event should describe to a state transition

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table] it is that event and is set as the object of a simulation by shifting), state-transition judging section 50b progresses to a step SC 7. Since in now the event "S1:OFF->ON" is described by the state transition table shown in drawing 3 as <an event 2> and is set as the object of a simulation, the decision result of a step SC 6 serves as "YES." At a step SC 7, time amount comparator 50e judges whether there is a compare difference about the time of day in the wave-like changing point of the event which state-transition judging section 50b incorporated, and the accumulation time amount by which current storage is carried out at time amount accumulation section 50c, or there is between difference minutes. When this decision result is "NO", time amount comparator 50e progresses to a step SC 9. On the other hand, when the decision result of a step SC 7 is "YES" (i.e., when there is between difference minutes), it progresses to a step SC 8. since it is not a thing about the instruction for making the processing which in now <whose event 2> is an event in which the detecting signal of a sensor 32 changed from OFF to ON, and has CPU24 in a peripheral device perform -- difference -- there is no time amount, the decision result of a step SC 7 serves as "NO", and time amount comparator 50e progresses to a step SC 9. At a step SC 8, after time amount comparator 50e subtracts between difference minutes from addition or accumulation time amount to the accumulation time amount by which current storage is carried out at time amount accumulation section 50c and makes time amount accumulation section 50c memorize the result, it progresses to a step SC 9.

[0087] At a step SC 9, state-transition judging section 50b progresses to a step SC 10, after determining a corresponding cel with reference to the state transition table read from the state-transition-table storage section 13 based on the condition of being stored in the event and 18d of condition storing sections incorporated from event analysis section 50a. Since <the condition 1> is stored in 50d of condition storing sections while having incorporated <the event 2> from event analysis section 50a in now, state-transition judging section 50b determines a cel (1 2) with reference to a state transition table. At a step SC 10, it progresses to a step SC 11, after adding state-transition judging section 50b to the accumulation time amount which reads a before overhead time from the storage area of the overhead-time storage section 45 corresponding to the cel determined by processing of a step SC 9, and is memorized by time amount accumulation section 50c and making time amount accumulation section 50c memorize the addition result. However, since there is no overhead time in the case of the cel of the state transition table which the cel determined by processing of a step SC 9 shows to drawing 11 , no state-transition judging section 50b is carried out, but progresses to a step SC 11. After adding to the accumulation time amount (0ms) to current [which reads a before overhead time (0.2ms) from the storage area of the overhead-time storage section 45 corresponding to / the case of now / a cel (1 2) in state-transition judging section 50b, and is memorized by time amount accumulation section 50c], time amount accumulation section 50c is made to memorize an addition result (0.2ms). At a step SC 11, after state-transition judging section 50b adds to the accumulation time amount which reads the processing time corresponding to the action concerned from the processing-time storage section 44, and is memorized by time amount accumulation section 50c and makes time-amount accumulation section 50c memorize the addition result while it checks the function of action processed in the cel determined by processing of a step SC 9, it progresses to a step SC 12. While state-transition judging section 50b checks the function of action called a drive halt of a motor 35 processed in a cel (1 2), the drive of a motor 37, and the write-in demand of the magnetic data to magnetic-head 34a in now After adding to the accumulation time amount (0.2ms) to current [which reads the processing time (4ms) corresponding to the action concerned from the processing-time storage section 44, and is memorized by time amount accumulation section 50c], time amount accumulation section 50c is made to memorize an addition result (4.2ms). After state-transition judging section 50b also combines the condition of the state transition table of actuation of the peripheral device corresponding to the action and storing it in 50d of condition storing sections when action of the cel concerned is control of a peripheral device while reading the condition of the transition place described by the cel determined by processing of a step SC 9 from the state-transition-table storage section 43 and storing in 50d of condition storing sections, it progresses to a step SC 13 at a step SC 12. in now, it describes in a cel (1 2) -- having had (<condition 2>) -- after generating {an event 1, i.e., a write-in demand,} since action of the cel concerned is the

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write-in demand of the magnetic data to magnetic-head 34a while carrying out reading appearance from the state-transition-table storage section 43 and storing in 50d of condition storing sections. {a condition 1} is collectively stored in 50d of condition storing sections. At a step SC 13, it progresses to a step SC 14, after adding state-transition judging section 50b to the accumulation time amount which reads an after overhead time from the storage area of the overhead-time storage section 45 corresponding to the cel determined by processing of a step SC 9, and is memorized by time amount accumulation section 50c and making time amount accumulation section 50c memorize the addition result. However, since there is no overhead time in the case of the cel of the state transition table which the cel determined by processing of a step SC 9 shows to drawing 11 , no state-transition judging section 50b is carried out, but progresses to a step SC 14. After adding to the accumulation time amount (4.2ms) to current [which reads an after overhead time (0.3ms) from the storage area of the overhead-time storage section 45 corresponding to / the case of now / a cel (1 2) in state-transition judging section 50b, and is memorized by time amount accumulation section 50c], time amount accumulation section 50c is made to memorize an addition result (4.5ms). At a step SC 14, after memorizing state-transition judging section 50b in the simulation result storage section 51 by making into a simulation result the accumulation time amount accumulated by time amount accumulation section 50c and the condition of the transition place stored in 50d of condition storing sections, it returns to a step SC 5. In now, accumulation time amount (4.5ms) and the condition (<a condition 2> and {condition 1}) of a transition place are memorized by the simulation result storage section 51 as a simulation result.

[0088] On the other hand, when the decision result of a step SC 3 is "NO" (i.e., when the trial script file which should be continued from the event input section 49 to event analysis section 50a is not inputted), it judges that the simulation based on all the trial script files memorized by the trial script storage section 46 ended state-transition judging section 50b, and progresses to a step SC 15. At a step SC 15, after state-transition judging section 50b reads the simulation result memorized by the simulation result storage section 51 and supplies it to a man machine interface 41, it ends simulation processing. Thereby, an old simulation result is displayed on display 41a of a man machine interface 41.

[0089] The simulation corresponding to them is explained to the generating list of the event which time amount early to the degree of the event "S1:OFF->ON" of an event input sequence should be made to generate hereafter, and the event after it. In addition, although explained below, without touching on processing of each step of the flow chart shown in

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[Translation done.]

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